News Release From

Universities Space Research Association (USRA)

Contact:

Mike Bennett
Public Affairs
USRA/SOFIA
Phone: 650-604-2128
Email: mbennett@aspsky.org

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300 SOLAR-MASS PROTOSTAR DISCOVERED

Göran Sandell of the Universities Space Research Association has discovered the most massive protostar yet observed—a huge disk of gas 300 times the mass of our Sun. Further studies of the object, named NGC 7538S, may yield important clues about the formation process of very high-mass stars. Dr. Sandell studied the object using the 15-meter (50-foot) James Clerk Maxwell Telescope (JCMT) on Mauna Kea, Hawaii. His findings are being presented at the American Astronomical Society meeting in Pasadena, California on June 6, 2001.

The protostar is imbedded in a huge gas cloud in the constellation Cepheus near the region called NGC 7538. Located approximately 7000 light years from Earth, the object consists of a giant disk of dense gas nearly 300 times the size of our solar system.

"Many other protostars–gas clouds shrinking under gravity on their way to becoming stars–are known,"

said Dr. Sandell. "This one is especially interesting because, so far, it is the most massive protostar seen. It could tell us a lot about how the most massive stars in our galaxy are formed."

Dr. Sandell used a camera mounted on the JCMT that is optimized to detect and record "submillimeter" energy, enabling him to see deeper into the cloud than previous observers. Submillimeter energy, with a wavelength range longer than infrared but shorter than radio waves, penetrates gas clouds very efficiently. His submillimeter map shows a disk-shaped gas cloud, nearly 300 times the size of our solar system with an estimated mass of 300 Suns. Because of its size and density, it must be gravitationally unstable, rapidly collapsing under its own weight.

"All these factors point to only one conclusion," commented Dr. Sandell. "This object is a protostar, and a big one. It's in the process of forming one or more very massive stars. The formation process of high-mass stars—more than 10 times the mass of our Sun—is very poorly understood," said Dr. Sandell. "Future observations of this giant collapsing gas cloud should help us understand that process better. For instance, will it throw off most of the gas before it becomes a star, or will it somehow break up to form several stars? We just don't know."

Dr. Sandell is now a Senior Scientist working on SOFIA (Stratospheric Observatory For Infrared Astronomy), a 2.5-meter (8-foot) infrared telescope mounted in a highly modified Boeing 747. "I need SOFIA so that I can determine the detailed temperature structure of this protostar," says Dr. Sandell, a long-time hunter of protostars.

NASA and the German Aerospace Center (DLR) are working together to develop SOFIA. Flying at 39,000 to 45,000 feet, it will be the world's largest airborne observatory, enabling observations that are impossible for even the largest and highest of Earth-based telescopes. Expected to begin operations in 2004, SOFIA is being developed and will be operated for NASA and DLR by USRA.

The James Clerk Maxwell Telescope (JCMT) is operated on a joint basis between the United Kingdom Particle Physics and Astronomy Research Council (PPARC), the Netherlands Organization for the Advancement of Pure Research (ZWO), the Canadian National Research Council (NRC) and the University of Hawaii (UH). Dr. Sandell was a senior staff scientist at JCMT when this research project was initiated.

The Universities Space Research Association is a 32-year old private, non-profit group of 87 institutions formed so that universities can cooperate effectively with one another, with the government, and with other organizations to further space science and technology, and to promote education in those areas.

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Click here for a color image of the submillimeter map of the NGC 7538 region with captions and credits.

For more information about the James Clark Maxwell Telescope, go to http://www.jach.hawaii.edu/JACpublic/JCMT/

For more information about SOFIA and USRA, go to http://www.sofia.usra.edu